AbstractID: 6625 Title: Simplification of a Standard Method Used for the Measurement of the Sub-System MTF in Digital Mammography

Purpose: The determination of the sub-system resolution using the modulation transfer function (MTF) on one manufacturer's digital mammography machine is a requirement for the annual physics survey. The purpose of this study is to reduce the number of steps in the process.

Method and Materials: In performing the required test, it is specified that the MTF values are determined at two frequencies for each of eight MTFs. In the manufacturer's protocol, six numbers are required for the determination of thesetwo values using the built in region-of-interest (ROI) tool and the image of a line-pair phantom using a specified geometry. However, using the same images and same ROI tool, these values can be approximated using only three numbers and a simpler formula. The two methods were compared empirically using the same images. Mathematical analysis was also used to determine the accuracy of the approximation.

Results: Under the conditions specified by the manufacturer, MTF values obtained using the proposed approximation are virtually identical to those obtained using the standard technique for the large focal spot. For the small focal spot, the approximation may underestimate the specified formula values by up to a few percent.

Conclusion: An approximation to the MTF formula specified for a physics digital mammography QC test reduces by half the required number of recorded values. Because the error, if any, underestimates the values obtained using the specified formula, passing the manufacturer's requirements using the approximation guarantees that the system would pass using the original formula. For the tested system (molybdenum and rhodium, large and small focal spot, parallel and perpendicular to the tube axis), use of the approximation decreases the number of recorded values needed from 48 to 24. The result is a substantial saving in the time required to perform the test.